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COMMITTEE ON PAPERS AND PUBLICATIONS:

J. F. GEISLER,
A. C. HALE,
A. A. BRENEMAN, Editor.

ABSTRACTOR FOR AMERICAN PATENTS:

J. F. GEISLER.

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The Regular Monthly Meeting is held on the first Friday of every month, at 8 P. M.

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The Committee on Papers and Publications respectfully call attention to the resolutions of the Society, requiring that papers be submitted to the Committee before being read.

Authors will be furnished, gratis, with 20 reprints of each article published in the Journal, *if application for the same be made when the article is sent.*

Members are requested to give notice of any change of address, or failure in the delivery of the Journal. All communications relating to the Journal should be addressed to the Editor.

A. A. BRENEMAN, 97 Water St., New York.

Vice-President Waller in the chair.

The minutes of the April meeting were read, amended and accepted as amended.

Dr. Waller, as one of the committee appointed to investigate the matter relating to local co-operation of scientific bodies, referred to in the communication from Dr. Britton, made an informal report.

The following members were elected :

Dr. C. S. Boynton, 26 Lafayette place, Burlington, Vt.

A. L. Kennedy, Burlington, Vt.

Dr. G. W. Roberts, 137 W. 34 St., N.Y.

E. D. Williams, Short Hills, N.J.

G. W. Riggs, Ph.B., Ridgefield, Conn.

As Associate :

A. O. Ingalls, Murray, Idaho.

The following gentlemen were nominated for membership :

Dr. Walker Bowman, 76 Broad street, New York.

H. J. M. Schroetter, 342 Washington Boulevard, Chicago, Ill.

Edwin Van Dyck, 5 Spencer place, Brooklyn, N.Y.

For Associate Membership :

H. A. Cutting, M.D., Lunenberg, Vt.

Alexander Maitland, 147 Times Building, N.Y.

The following papers were read : "On Lima Oil," by A. Bourgougnon and J. A. Mandel; read by the Secretary.

"On Condensed Milk," by A. Bourgougnon; read by the Secretary.

"On the action of 66° Sulphuric Acid on Hydrochinon and the Value of the Resulting Sulpho Acid as a Developer for Gelatino-Bromide Plates." (Preliminary Notice) by J. H. Stebbins, Jr.; read by the author.

Mr. Stebbins moved that the Auditing Committee be known hereafter as the Finance Committee.

Prof. McMurtrie, offered an amendment providing that the matter be referred to the Board of Directors.

Amendment accepted and carried.

Prof. Barker announced that the council of the American Association for the Advancement of Science had decided to call the Annual Meeting for August 17th and 18th, and that he had a communication from Prof. F. W. Clarke inviting the American Chemical Society to hold its next General Meeting at the same time.

Prof. McMurtrie moved that the communication from Prof. Clarke be referred to the Board of Directors. Carried.

The meeting was then adjourned.

DURAND WOODMAN,
Recording Secretary.

OBITUARY.

JAMES BUCKTON MACKINTOSH.

This promising member of the American Chemical Society died April 15th, 1891, at the age of thirty-one years.

He was born at Bebington, near Birkenhead, in Cheshire, England, on December 29th, 1859. Owing to the death of his mother while he was very young his early education was obtained under the direction of his father's niece. As the little town where he was born is on the banks of the Mersey, opposite the city of Liverpool, he attended the Institute Schools of that well-known centre and ranked at the head of his classes in mathematics, chemistry and electricity, subjects that, in after life, proved so fruitful of good results in his scientific work. In May, 1873, he passed the local examination of these schools and became "An Associate In Arts of the University of Oxford," and he also passed the examination of the Science and Art Department of the Committee of Council of Education of the English Government, and held a certificate for the same.

In August, 1873, his family came to America and he entered the School of Mines of Columbia College, graduating in 1877 with the dual degree of E.M. and C.E. Remaining in the school he did a large amount of original work on metallurgical subjects which placed him in the front rank of authorities on these matters. His methods of working were marked for their accuracy and delicacy and caused him to be in demand among those manufacturers and others who required special researches upon metallurgical processes. In the year 1886 he went to the Lehigh University to take charge of the chemical laboratory of that institution, and in May, 1888, he became chemist to the Consolidated Gas Company of New York, which position he occupied at the time of his death.

During his later years he was interested in the extraction and preparation of the rare earths of the lanthanum group, and his

excellent work on these metals was cut short by his untimely death.

As a man Mr. Mackintosh was of a most gentle nature, and those who knew him best loved him most. Among scientific workers he was full of enthusiasm and quick to observe practical ideas. As a manipulator of delicate apparatus he had few equals, and this, combined with a clear knowledge of the sciences generally, was the sources of his success. Cut off in his best years we feel that science has lost one of her devoted workers, and his friends a co-laborer whose place in their esteem it is hard to fill.

> Loathing pretense, he did with cheerful will
> What others talked of, while their hands were still.

ON THE ACTION OF 66° SULPHURIC ACID ON HYDROCHINON AND THE VALUE OF THE RESULTING SULPHO ACID AS A DEVELOPER FOR GELATINO-BROMIDE PLATES.

By James H. Stebbins, Jr.

Preliminary Notice.

Since the introduction of the dry plate in photography many substances have been proposed as developers, but the only practical survivors of the substances thus proposed are pyrogallic acid, ferrous oxalate, hydrochinon, and more recently eikonogen, or the sodium salt of amido-β-naphtholmonosulpho acid. Having at one time had occasion to employ hydrochinon as a developer, I was struck with the beautiful qualities of the plates developed by its means, but, although hydrochinon is *per se* a most excellent developer, it has, nevertheless, several drawbacks, among which are its limited solubility in water, and it was this very question of solubility which started me upon the present investigation. It seemed that if hydrochinon could be converted into a mono-sulpho acid, that its solubility would be very materially increased, and if this could be accomplished without in any way affecting its reducing qualities for the haloid salts of silver, a very material improvement would be obtained.

Finding only very meagre information in the literature upon this subject the following experiments were made.

Experiment 1.

20 grams of 66° sulphuric acid were mixed with 10 grams of hydrochinon, and then heated under constant stirring upon the steam bath, until the hydrochinon was all dissolved. The stirring was kept up for a few minutes longer, when suddenly the whole contents of the beaker solidified to a cake of small straw colored needles.

The cake was broken up and dissolved in cold water, in which it is very soluble, then converted into its lime salt by neutralizing the acid solution with calcium carbonate. The precipitate of calcium sulphate was filtered off and the filtrate of the lime salt placed upon the steam bath for concentration. After a short exposure to the air the solution began to darken, showing that oxidation was taking place. Concentration by this means had therefore to be abandoned. The solution was then placed under the air pump over sulphuric acid, hoping that by this means it may be concentrated without spoiling, but even in this case oxidation kept slowly taking place. It was therefore decided to treat the mixture with an excess of sodium sulphite and then concentrate in vacuo over sulphuric acid. On adding the sodium sulphite calcium sulphate was precipitated carrying considerable of the coloring matter with it. The precipitate was filtered off, and the filtrate containing the sulpho acid of hydrochinon was placed under the bell jar of the air pump over sulphuric acid, to concentrate, but owing to an accident, the contents of the beaker were spilled, and therefore the experiment had to be repeated.

EXPERIMENT 2.

10 grams of hydrochinon were treated as before with 20 grams 66° sulphuric acid. After the reaction the mixture was dissolved in water, heated upon the water bath, and neutralized with barium carbonate.

The barium sulphate was filtered off, and the filtrate containing the barium salt of the sulpho-acid was concentrated in vacuo over sulphuric acid. The barium salt thus obtained crystallized much more readily than the calcium salt and the solution of the same in water does not appear to be as readily oxidizable as the former when exposed to the air. It crystallizes from its aqueous solution in white, warty concretions of star-grouped crystals (needles).

A sample of the above barium salt obtained by rapidly boiling down a portion of its aqueous solution to dryness and then further drying over sulphuric acid gave the following results:

Water of Crystallization.

0.2810 grm. substance lost 0.0081 grm. H_2O

equivalent to water 2.88 per cent., or 1 mol. water of crystallization.

Ba. Estimation.

0.2810 grm. sub. gave 0.116 grm. Ba SO_4

Equivalent to Ba.....24.26 per cent.
Equivalent to Ba. in anhydrous salt.....24.98 "

On now attempting to calculate the molecular weight of the barium salt from the amount of barium sulphate formed, we get the following :

0.2729 anhydrous salt gave 0.116 gram. $Ba.SO_4$.

$.116 : 233\ (BaSO_4) :: 0.2729 : x\ ;\ x = 548.1$

The least molecular weight of the salt, carrying one atom of barium, is therefore 548.1.

One atom of barium might belong, however, to a substance containing either one or two sulpho-groups ; but, the theoretical molecular weight of barium hydrochinon disulphonate is 406, whereas the theory for barium hydrochinon monosulphonate is 515, (calculated from the formulæ $\left(p.C_6H_3\begin{cases}OH\\ \text{---}SO_3\\ OH\end{cases}\right)_2Ba,$) and consequently the former is excluded. Therefore the substance analysed is beyond much doubt the barium salt of a hydrochinon mono-sulpho acid.

On calculating the molecular weight from the salt containing water of crystallization we get :

$0.116 : 233 :: 0.281 : x\ ;\ x = 564.$

The theoretical molecular weight of the hydrated salt, or rather salt containing water of crystallization, is 533.

The theoretical amount of barium called for in the anhydrous salt is 26.6 per cent.

The theoretical amount of barium in the hydrated salt is 25.7 per cent.

The amount of water of crystallization found is 2.88 per cent. ; therefore,

$2.88 \div 18 :: 0.16$ mol. H_2O.

That is to say, that 100 parts of barium salt contain 0.16 mol. H_2O of crystallization ; therefore 548 parts of barium salt will

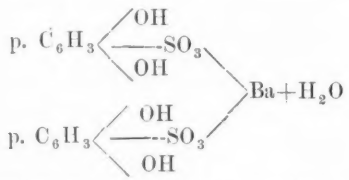
contain 100 : 0.16=548 : 4 ; 4=0.87 mol. H_2O, or in round numbers 1 mol. H_2O. We have therefore found :

Barium	24.26 per cent.
Water of crystallization	2.88 "
Molecular weight	564

Whereas theory calls for

Barium	25.7 per cent.
Water	3.40
Mol. weight	533

The formula of the barium salt is therefore, without much doubt :



The barium salt is readily soluble in cold water and dilute alcohol and insoluble in strong alcohol. It crystallizes from dilute alcohol in white, six-sided prisms. On adding ferric chloride to its aqueous solution, a momentary deep blue coloration is obtained, which, almost immediately, changes into a dirty yellow color.

POTASSIUM SALT.

This salt was obtained from the barium salt, by decomposing the latter with the theoretical amount of potassium carbonate. On rapidly concentrating the aqueous solution of the same, out of contact with the air as much as possible, it is obtained in the shape of little, yellowish white needles. Better results, however, are obtained by adding three or four volumes of alcohol to the concentrated aqueous solution, and then allowing the mixture to evaporate under the bell jar of an air pump. It is readily soluble in water.

FREE ACID.

$$p.C_6H_3-\left(HSO_3\right)\begin{cases}OH\\OH\end{cases}$$

The free acid may be obtained from the barium salt by accurately decomposing the latter with dilute sulphuric acid, filtering

off the $BaSO_4$, shaking up the filtrate with ether, and then distilling off the latter and allowing to crystallize. A simpler method, and one that works very well, is to place the cake resulting from the action of H_2SO_4 upon the hydrochinon, upon porous tiles, till the greater part of the excess of sulphuric acid has been absorbed. Then press the mass between filter paper until nearly every trace of H_2SO_4 has been removed. The mass thus obtained is dissolved in as little alcohol as possible, and set aside to crystallize under the air pump. The free acid is thus obtained in long, well defined brownish, transparent, rhombic prisms (some of the crystals were over 1 cm. long), containing alcohol of crystallization. When exposed over sulphuric acid it effloresces, giving off a part, or all, of its alcohol of crystallization.

0.1155 grm. sub. over H_2SO_4 lost. .0087 grm. alcohol=7.53 per cent. On now heating to 120° C. the said free acid lost .004 grm. more of alcohol. It will therefore be seen that the larger part of the alcohol of crystallization is lost over H_2SO_4.

The total amount of alcohol lost is therefore .0087+.004=.0127 gram.=10.9 per cent.

This equals 0.43 molecule, or in round numbers one-half molecule alcohol of crystallization.

Theory for $C_6H_3(HSO_3)(OH)_2$. One-half C_2H_6O calls for alcohol 10.7 per cent.

It begins to fuse at 98° c. and is completely fused at 104° c. (uncorrected). Dissolves readily in water and alcohol.

REDUCING ACTION UPON THE HALOID SALTS OF SILVER.

It was thought that the best way to test this question would be to submit some exposed gelatine dry plates to the action of the hydrochinon mono-sulpho acid. For this purpose a preliminary test was made, using an Eatman lantern slide plate, and a solution of the barium salt of the hydrochinon sulpho acid, made slightly alkaline with sodium carbonate. A positive of very fair quality was thus obtained, the tone of color being reddish brown. It developed up very slowly, however, but it is expected that better results will be obtained when using a developer of definite composition.

In conclusion I would state, that I hope soon to complete experiments upon this subject, and will then submit such further results as I may have obtained.

ON CONDENSED MILK.

By A. Bourgougnon.

The object in analyzing condensed milk is to find whether this product is derived from whole or skimmed milk. This knowledge is obtained by reconstituting the original milk, and in so doing one at least of the constituents of milk must be known, otherwise the problem would be indeterminate.

Let a, b, c, d, e, be respectively the water, fat, albuminoids, milk sugar and ash contained in a milk, these constituents together weighing 100 grms.

If now we add to this milk x grms. of cane sugar and evaporate the original water a, a quantity represented by ay (y fractional) it is evident that b, c, d, e have not changed in absolute weights, and that the condensed milk obtained from the 100 grms. of the original milk will weigh now

$$100+x-ay.$$

Since the analysis gives for the different constituents, per cent., new values a', b', c', d', e' in the condensed milk, it is evident that b of fat, on $100+x-ay$ total weight of condensed milk, represents on 1 of condensed milk

$$\frac{b}{100+x-ay}$$

and on 100

$$\frac{100\ b}{100+x-ay}=b'$$

b' being the percentage of fat in condensed milk, and in the

same manner we will have for any other constituent, θ, in the original milk

$$\frac{100\ \theta}{100+x-ay}=\theta'$$

Making $100+x-ay=D$, and since in general $\theta'=\frac{100\ \theta}{100+x-ay}$ we have

$$\theta'=\frac{100\ \theta}{D}$$

and

$$\theta=\frac{D\ \theta'}{100}$$

Consequently

$$b=\frac{D\ b'}{100}$$

$$c=\frac{D\ c'}{100}$$

$$d=\frac{D\ d'}{100}$$

$$e=\frac{D\ e'}{100}$$

This gives, immediately, $100\ \theta=D\ \theta'$ and $D=\frac{100\ \theta}{\theta'}$ and the denominator D can be found at once, as soon as we assume θ to be known in the original milk, by assuming, *a priori*, any one of the constituents, *a*, *b*, *c*, *d*, *e*.

If we assume *d*, then

$$D=\frac{100\ d}{d'}$$

and, knowing D, we can find readily *b*, *c*, *e* and *a* by difference from 100.

All the constituents of the original milk then are found without any difficulty by the simplest equations.

APPLICATION OF THE PRECEDING FORMULÆ.

Found in condensed milk:

a′	Water	25.47
b′	Fat	10.05
c′	Albuminoids	9.36
d′	Milk sugar	10.19
e′	Ash	1.92
x	Cane sugar	40.01
		100

Assuming that milk sugar = 4 p. c. in normal milk, we have

$$d=\frac{D\,d'}{100},\quad D=\frac{100\,d}{d'}=\frac{100\times 4}{10.19}=39.25$$

and

$$b=\frac{39.25\times 10.05}{100}=3.94 \text{ per cent. Fat in original milk.}$$

$$c=\frac{39.25\times 9.36}{100}=3.67 \text{ " Albuminoids " "}$$

$$d=\frac{39.25\times 10.19}{100}=4.00 \text{ " Milk sugar " "}$$

$$e=\frac{39.25\times 1.92}{100}=0.75 \text{ " Ash " "}$$

12.36	"	Solids " "
87.64	"	Water " "

Assuming respectively for *b* or *c* or *d* or *e* values increasing by 0.1, what will be the composition of the original milk calculated on these different assumptions and using the preceding formulæ.

Composition of an original milk:

a	Water	86.87
b	Fat	3.50
c	Albuminoids	4.92
d	Milk sugar	4.00
e	Ash	0.70
		99.99

to which we add 12.00 of cane sugar.

Water	86.87
Fat	3.50
Albuminoids	4.92
Milk sugar	4.00
Ash	0.70
Cane sugar	12.00
	111.99

or in per cent. .

Water	77.57
Fat	3.12
Albuminoids	4.39
Milk sugar	3.57
Ash	0.63
Cane sugar	10.72
	100.00

Further we concentrate to 90 per cent. of the original quantity of water.

Water	7.76
Fat	3.12
Albuminoids	4.39
Milk sugar	3.57
Ash	0.63
Cane sugar	10.72
	30.19

The composition per cent. of the condensed milk will then be :

a′ Water	25.70
b′ Fat	10.35
c′ Albuminoids	14.54
d′ Milk sugar	11.83
e′ Ash	2.08
x Cane sugar	35.50
	100.00

Then we know to a certainty that this condensed milk comes from an original milk of known composition and in assuming for *b*, *c*, *d*, *e* the values given we shall, from the values *a'*, *b'*, *c'*, *etc.*, of the condensed milk, find the composition of this original milk.

We have d=4.00

$$D=\frac{100\,d}{d'}=\frac{100\times 4}{11.83}=33.81$$

and

$$b=\frac{33.81\times 10.35}{100}=3.50 \text{ per cent. Fat in original milk.}$$

$$c=\frac{33.81\times 14.54}{100}=4.92 \text{ " Albuminoids " "}$$

$$d=\frac{33.81\times 11.83}{100}=4.00 \text{ " Milk sugar " "}$$

$$e=\frac{33.81\times 2.08}{100}=0.70 \text{ " Ash " "}$$

13.12 " Solids " "

86.88 " Water " "

As a verification the water *a* could be obtained directly.

Since we have

$$100+x-ay=D$$

ay=100+x—D = 112—33.81= 78.19, the weight of water evaporated, then there remains a—ay water in the original milk on a total weight D of condensed milk, corresponding in 100 to

$$\frac{100\,(a-ay)}{D}=a'$$

whence

$$a=ay+\frac{Da'}{100}$$

or

$$a=78.19+\frac{33.81\times 25.70}{100}=86.88$$

The following table shows the increase of 0.1 for *b*, *c*, *etc.*, that is, instead of $b=3.50$, $b=3.60$. Instead of $c=4.92$, $c=5.02$, *etc.*

Original Milk.	Proceeding by increase of 0.1 per cent. and assuming			
	d	b	c	e
a=86.87	86.55	86.50	86.59	84.99
b= *3.50*	3.586	*3.60*	3.77	4.00
c= *4.92*	5.04	5.06	*5.02*	5.62
d= *4.00*	*4.10*	4.11	4.08	4.58
e= *0.70*	0.716	0.72	0.71	*0.80*
x=12.00	12.30	12.34	12.24	13.72
D=33.81	34.65	34.78	35.27	38.65

We see that assuming *e*, the ash is out of the question ; its percentage being always small, it is the constituent for which the smallest difference has the greater results.

c, *b* and *d* appear to be the constituents of which the variations have the least influence, in fact any of these three assumptions of increase of 0.1 per cent. in *c*, *b* and *d* does not practically affect the composition of the original milk these constituents entering for nearly 4 per cent. each in the milk. Then we are limited in our choice to the one of these constituents of which the variations being the least, the average is the nearest to a constant. If milk sugar is such a constituent, as it appears to be, it is the one to be assumed.

To verify the correctness of the preceding formulæ, let us take again the original milk.

a Water	86.87
b Fat	3.50
c Albuminoids	4.92
d Milk sugar	4.00
e Ash	0.70
	99.99

from which, after the addition of cane sugar and the evaporation of water, the following condensed milk has been obtained.

a′ Water	25.70
b′ Fat	10.35
c′ Albuminoids	14.54
d′ Milk sugar	11.83
e′ Ash	2.08
x Cane sugar	35.50
	100.00

After the addition of x of cane sugar to the normal milk and the evaporation of ay of water, the mixture weighs

$$100+x-ay=100+x-86.87\ y$$

and there is left $a-ay=a(1-y)$ water in the condensed milk, and it contains

Water	$a(1-y)=86.87\ (1-y)$
Fat	b′
Albuminoids	c′
Milk sugar	d′
Ash	e′
Cane sugar	x

In the condensed milk weighing $100+x-86.87\ y$ we have

$$a(1-y) \text{ water}$$

and in 100

$$\frac{100\ a\ (1-y)}{100+x-86.87\ y}$$

and we have then

a′ Water	$\frac{86.87-86.87\ y}{100+x-86.87y}=25.70$
b′ Fat	$\frac{100\ b}{100+x-86.87\ y}=10.35$
c′ Albuminoids	$\frac{100\ c}{100+x-86.87\ y}=14.54$
d′ Milk sugar	$\frac{100\ d}{100+x-86.87\ y}=11.83$
e′ Ash	$\frac{100\ e}{100+x-86.87\ y}=2.08$
x Cane sugar	$\frac{100\ x}{100+x-86.87\ y}=35.50$

To find the values of x and y we can operate upon any of these equations, since we know the composition of the original milk.

Taking d=4 and b=3.50 we have

$$350=1035+10.35\,x-899.10\,y$$
$$400=1183+11.83\,x-1027.67\,y$$

whence

$$y=0.811 \text{ and } x=4.26$$

and the common denominator will be

$$104.26-70,45=33.81$$

as we had found before by a shorter method.

As we have remarked, it is indispensable to know at least one of the constituents of the original milk to be able to calculate its composition from the values obtained from the condensed milk.

If in the milk under consideration we had assumed only that it contains 86.87 per cent. of water it is evident that from the equations

$$\frac{8687-8687\,y}{100+x-86.87\,y}=25.70$$

and

$$\frac{100\,x}{100+x-86.87\,y}=35.50$$

we could obtain the composition of the original milk.

Resolved, these equations give

$$x=12 \text{ and } y=0.9$$

and as before 31.81 for factor.

If we do not assume any known quantity in the original milk the equation for water is

$$\frac{100\,a\,(1-y)}{100+x-ay}=25.70.$$

and the problem is indeterminate.

OHIO PETROLEUM.

By J. A. Mandel and A. Bourgougnon.

This petroleum, produced at Lima, Ohio, is of a dark green color, very fluid, and marks 48° Baumé at 15° C. (Sp. Gr., 0.791). We did not observe that peculiar objectionable odor which the crude oil pumped from the oil fields of Ohio is said to possess. The refined products, naphtha and burning oil, had the same smell as that of the distillates obtained from Pennsylvania petroleum.

The refining of the naphtha was easily attained with sulphuric acid and washing.

The burning oil purified in the usual manner with sulphuric acid, caustic soda and washing, furnished a burning oil water white, without any fluorescence, better than standard.

The distillation in fifty parts, each part representing two per cent. by volume, gave the following results:

Per Cent.	Specific Gravity.	Per Cent.	Specific Gravity.	Per Cent.	Specific Gravity.	Per Cent.	Specific Gravity.	Per Cent.	Specific Gravity.
2	0.680	22	?30	42	?82	62	804	82	818
4	683	24	?35	44	?88	64	808	84	818
6	685	26	?40	46	?92	66	812	86	810
8	690	28	?42	48	800	68	820	88	815
10	694	30	?46	50	802	?0	825	90	815
12	698	32	?60	52	806	72	830	92	Residuum.
14	?00	34	?64	54	806	73	830	94	
16	?06	36	?68	56	806	?6	810	96	
18	?20	38	?72	58	806	?8	820	98	
20	?28	40	?78	60	800	80	820	100	

RETURNS.

16	per cent.	Naphtha, ?0° Baumé.
68	"	Burning oil.
6	"	Paraffine oil.
10	"	Residuum.

The distillation started at 23° C. (we received this sample in the last part of October, 1890), this being due to the large amount of naphtha present, and when 60 per cent. were reached, at a temperature of 310° C., the hydrocarbons remaining in the retort were dissociated then gases escaped, lighter distillates were obtained, and as usual in such cases, the temperature decreased as indicated by the thermometer placed in the retort.

This decrease in the temperature was considerable, from 310° C. the thermometer went down gradually to 200° C. until 75 per cent. of oil were obtained, and from this point the temperature remained constant until the end of the distillation, therefore these hydrocarbons in *statu moriendi* absorbed much heat.

The areometer for liquids lighter than water, or a "*pese esprit*" of Baumé is universally adopted in all dealings with petroleum and its products for the determination of the weight of unity of volume.

One of us has given (*Proc. Am. Chem. Soc., Vol. 1, No. 5, p. 55*), formulæ for the conversion of areometric degrees into corresponding specific gravities for the hydromajor and hydrominor instruments of Baumé.

The calculated table for liquids heavier than water has been integrally reproduced (*Tucker Sugar Analysis, p. 109*).

For the modulus of the areometer for liquids lighter than water, several numbers have been proposed ; Dr. Tucker gives 146 against 144.329 as calculated and recorded in the communication above referred to. To calculate the constant number of an areometer it is necessary to know two specific gravities corresponding to two degrees of the scale, the number 144.329 was obtained by taking the 66th degree corresponding to 0.720 (*loc. cit.*)

Baumé has not given the specific gravities of the salt solutions he employed for the graduation of his instruments, and therefore these solutions are no longer employed.

The earliest specific gravity of the salt solution employed for the graduation of Baumé's hydrominor instrument that we could find is 1.073 (*Chevallier, Art de l' Ingénieur, etc., Paris, 1819*).

Adopting this specific gravity, and keeping the same notation as employed in the paper cited above, we have

$$\frac{V}{v}=\frac{1.073}{1} \text{ and } \frac{v+10}{v}=1.073$$

whence

$$v=136.9.$$

Gay-Lussac observed that the 30th degree of the areometer of Cartier corresponded to the 32d degree of Baumé; he also found that the 28th Cartier corresponded to the specific gravity 0.8791, therefore these two instruments can be employed to verify the correctness of their respective graduation.

$$1^\circ \text{ Cartier}=\frac{32}{30} 1.066 \text{ Baumé}$$

$$28^\circ \text{ C}\times 1.066=29.848 \text{ B}$$

$$\frac{144.329}{134.329+29.848}=0.8791$$

and again,

Absolute alcohol at 15° C. has a specific gravity=0.795 and mark 44° Cartier

$$44\times 1.066=46.904 \text{ B.}$$

In the table we read 47° B=0.795 specific gravity, a satisfactory result, since the numbers employed in these calculation have not a common measure.

Abstracts of American Patents Relating to Chemistry.

(*From the U. S. Patent Office Gazette.*)

Issued May 5th, 1891.

451,487.—Process for making Paris-green. John C. Jessup, Digton, Mass.

451,502.—Blue dye. Johannes Mohler and Carl A. Mayer, Basle, Switzerland.

A sulpho-acid derived from tannin, aniline and nitroso-dimethylamine having the form of dark crystalline powder insoluble in acidulated water, but slightly soluble in pure cold water, and with difficulty soluble in boiling water, and combined with alkalies it forms salts that are readily soluble in either warm or cold water.

451,531.—Process of neutralizing sulpho-chlorinated oils. Adolph Sommer, Berkeley, Cal.

Previous to the addition of chloride of sulphur an oxide or other compound of manganese is incorporated with the oil to be heated.

451,540 and **451,541.**—Secondary battery. George A. Washburn, Cleveland, Ohio.

451,592.—Process of coating metal. Francis J. Clamer, Philadelphia, Pa.

The metallic surfaces are cleansed in suitable cleansing baths, immersed in a bath of muriatic acid, then in a bath of saturated solution of tin, zinc and muriatic acid, and finally coated in a bath composed of lead, sal-ammonia, arsenic, and phosphate of lead.

451,612.—Method of utilizing products of combustion. Emil Biedermann and E. W. Harvey, Westminster, Eng.

451,642.—Process of purifying suint. Israel Roos, Frankfort-on-the-Main, Germany.

The wool fat is first treated with hot water, then with alkaline solution, the mixture is boiled, allowed to cool and settle, the non-saponifiable matter is separated, then treated with dilute acid, and finally washed with water.

451,660.—Process of refining hydro-carbons. Edward D. Kendall, Brooklyn, N.Y.

Mineral hydrocarbon oils containing sulphur are mixed with mercuric chloride in solution, and the absorbed mercuric compound is finally removed by means of a suitable sulphide.

451,679.—Apparatus for manufacturing alcohol from sugar cane. Gaston Descamp, Havana, Cuba.

451,706.—Yeast cake. James W. Cameron, New York, N.Y.

A yeast cake enclosed in a shell of flour paste and chalk (soapstone).

453,724.—Process of purifying petroleum distillates. Thomas J. Gordon, Lima, Ohio.

451,799.—Process of ornamenting artificial stone. William Bleiss, Kansas City, Mo.

451,847.—Artificial musk. Albert Baur, Gispersleben, Germany.

A trinitrated hydrocarbon derived from toluene or its homologues in solid crystalline form characterized by the odor of natural musk.

Issued May 12th, 1891.

451,926.—Concentrating apparatus. Ryerson D. Gates, Chicago, Ill.

451,948.—Galvanic battery. G. C. McCullough, Richmond, Ind.

452,030.—Process of manufacturing sodium and potassium. Hamilton Y. Castner, London, Eng.

452,062.—Apparatus for the manufacture of sugar. Louis E. A. Prangey, Paris, France.

452,063.—Manufacture of refined sugar. Louis E. A. Prangey, Paris, France.

452,072.—Apparatus for bleaching paper pulp. Joseph Jordan, Bridgeport, Pa.

452,125.—Apparatus for extracting metals from their ores. Werner von Siemens, Berlin, Germany.

452,149.—Device for fermenting beer. Jacob F. Theurer, Milwaukee, Wis.

452,197.—Orange yellow dye. Jacob Schmid, Basle, Switzerland.

An orange yellow dye stuff derived from salicylic acid and resorcin, which appears in the form of an orange brown paste, or when dry as an orange brown powder, easily soluble in water and alcohol, and insoluble in benzine.

452,210.—Process of dyeing with gallacetophenone. René Bohn, Ludwigshafen-on-the Rhine, Germany.

452,246.—Apparatus for the manufacture of hydrogen gas. James W. Tallmadge, Albany, N. Y.

452,263.—Process for making white lead. Ellert W. Dahl, New York, N. Y.

452,273.—Ammonia absorber. Frederick Kaiser, Knoxville, Tenn.

452,324.—Process of dyeing aniline black. Heinrich Thies, Barmen, Germany.

Vegetable fibres, etc., are exposed to the action of aniline oil in the presence of hydrochloric acid, an alkaline salt, and hydrofluoric acid.

Issued May 19, 1891.

452,378. — Process of making ammonium sulphite. Prosper de Lachomette, Lyons, France.

Dry ammonia and sulphurous gas are conducted in suitable proportions into a saturating tank.

452,386.—Process of making lead sulphate. Heaton Pennington, Chicago, Ill.

Lead acetate is first prepared from metallic lead and then treated directly with a suitable quantity of sulphuric acid.

452,405.—Apparatus for preparing infusions of coffee. George R. Wilson, Finsbury, Eng.

452,407.—Process of making hard potash soap. Johann N. Zeitler, Carmstadt, Germany.

452,439.—Production of reclaimed rubber. Rudolph A. Loewenthal, New York, N. Y.

452,454.—Process of extracting sugar from molasses. Marie F. E. E. Marondeau, Paris, France.

452,479.—Method of manufacturing articles of combined hard rubber and metal. Frank Lambert, Brooklyn, N. Y.

452,507.—Apparatus for concentrating solutions. John Patten, New York, N. Y.

452,512.—Apparatus for impregnating liquids with gas. Ulrich Bachman, San Francisco, Cal.

452,535.—Condenser-coil for ice-making machines. Ehrgott T. Winkler, Philadelphia, Pa.

452,536 —Ice-making and refrigerating machine. Ehrgott T. Winkler, Philadelphia, Pa.

452,537.—Compression pump for ice-making machines. Ehrgott T. Winkler, Philadelphia, Pa.

452,538.—Combined rain-water cut-off and filter. William W. Bays, Knoxville, Tenn.

452,578.—Process for refining crude petroleum. Charles C. Mengel, Sr., Bay City, Mich.

452,676.—Ore-concentrator. Fred. Manuel and Kennith M. Reeves, Helena, Mont.

452,697.—Process and apparatus for the manufacture of gas. Walter P. Elliott, New York, N. Y.

452,783.—Process of manufacturing mineral wool. Charles H. Rockwell, Cleveland, Ohio.

452,760.—Composition of matter for insulating purposes. Frederick Salathe, Jersey City, N. J.

A compound of some hydrocarbon product, sulphur and india rubber, gutta-percha, or oxidized linseed oil.

452,764.—Hydrocarbon product. Frederick Salathe, Jersey City, N. J.

A solid material of the C_{10} H_{16} series, having sp. gr. 1.028, tough and of a glossy, jet black color, flexible and somewhat plastic at ordinary temperatures, soluble in naphtha and turpentine, capable of withstanding a temperature of 600° F., and resisting acids and alkalies, excepting concentrated nitric and concentrated sulphuric acids.

Issued May, 26, 1891.

452,794.—Melting furnace, William W. Keys, Bridgeport, Conn.

452,800.—Method of soldering aluminium. Frank J. Page and Harry A. Anderson, Waterbury, Conn.

The surfaces to be joined are fluxed with silver chloride and solder is then introduced upon the surfaces.

452,821.—Manufacturing of phosphorus. Herbert H. Wing, Buffalo, N. Y.

A mixture of a phosphate and a silicate is calcined in a reducing flame, whereby the phosphoric anhydride is expelled and reduced. The fumes are conducted through a depositing chamber, which is kept at a temperature of about 500° F., in which the red phosphorus is deposited. The remaining fumes are passed through water chambers wherein the yellow phosphorus is condensed.

452,869.—Artificial ivory. George W. Tooker, New York, N. Y.

Made from albumen, bone-ash powder talc, and fibrous material.

452,967.—Process of refining linseed oil. Thomas H. Grey, Bermondsey, Eng.

The oil is first treated with a solution of caustic alkali of a strength of about 30°. Common salt is finally added, the whole thoroughly mixed, allowed to settle and the clear oil decanted.

453,005.—Apparatus for producing anhydrous ammonia. Daniel L. Holden, New York, N.Y.

453,035.—Guaiacol ether. Joseph Bougartz, Aachin, Höchst-on-the-Main, Germany.

453,105.—Water purifier. Eugene Britney, Indianapolis, Ind.

453,115.—Mineral wool. Charles H. Hubbell, St. Louis, Mo.

453,187.—Process of making basic persulphate of iron. Joseph Van Ruymbeke, Chicago, Ill.

Sulphuric acid and oxide of iron are mixed and heated to a temperature of 380 to 500° F., until the water has been expelled and a persulphate of requisite basicity produced.

453,140—Apparatus for the manufacture of carbon black. Edwin Binney, New York, N. Y.

J. F. G.